

PATENT SPECIFICATION

569,000



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29 JAN 1946

COMPLETE SPECIFICATION

Improvements in Tubes for Heat Exchange Apparatus

I, EDWARD FRANK SPANNER, of 10, Hopton Road, Streatham, London, S.W.16 (British), do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention is concerned with tubes—used for passing liquids or gases through heat exchange apparatus—of the type in which the wall of each tube has two or more spiral grooves impressed in it for some portion of its length.

The invention has for its object the securing of greater heat transfer per unit of tube surface by assuring greater turbulence in the flow of gas or liquid through tubes grooved in accordance with this invention than is assured when flow is through tubes grooved in accordance with known practice.

With tubes of known practice, a cross-section of the tube at right angles to its length shows two or more wall indentations each of which is symmetrical about a radial line drawn from the centre of the tube through the centre of an indentation.

Further, in tubes of known practice, a longitudinal section through the centre of the tube shows wall indentations which are symmetrical about a line drawn through the centre of the indentations at right angles to the axis of the tube.

The present invention improves on known practice by providing a tube in which the cross section of any groove is sharper and steeper on one side of a radial line through the centre of the tube and the lowest point of the section of that groove than it is on the other side of that radial line.

Similarly if a longitudinal section is taken through the centre of an improved tube according to the present invention, the longitudinal cross section of any groove is sharper and steeper on one side of a line, drawn at right angles to its axis through the centre of the tube and the lowest point of the section of the groove, than it is on the other side of that line.

Referring to the accompanying drawings, Figure 1 shows a cross section of a spirally grooved tube in accordance with

known practice and Figure 2 a longitudinal section through such a tube.

Figure 3 shows a cross section of a spirally grooved tube in accordance with this present invention and Figure 4 a longitudinal section through such a tube.

When a tube in accordance with this invention is being used to secure heat transfer from a stream of hot gas, the direction of flow would be as shown by the arrows. For the same difference of pressure between the two ends of the tube the velocity would be greater in the tube according to the present invention than it would be in tubes according to known practice since there would be less obstruction to flow on account of the easier slope of the walls of the tube as they approach the "crests" of the grooves. Further this increased in velocity would result in a more rapid swirl of gas into the centre of the tube, better admixture of hot and cooler gas, and hence less opportunity of a hot stream of gas passing clear through along the centre line.

When used for heating or cooling viscous liquids, such as oil, which generally flow through at a comparatively slow speed, the direction of flow can advantageously be reversed, the essential break-up and admixture of the central core of the liquid flow with the liquid which has been in contact with the walls of the tube being ensured by the steeper angle at which the liquid from the walls is thrown off from the crests of the grooves towards the axis of the tube.

The invention is applicable to all spirally grooved tubes, whether these have continuous or interrupted grooves (1) of constant depth and pitch, (2) constant depth and varying pitch, (3) constant pitch and varying depth, (4) varying depth and varying pitch, or (5) any other preferred arrangement.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

Tubes of the type referred to for the passage of liquids or gases in heat exchange apparatus characterised by the

fact that the cross section of any groove is sharper or steeper on one side of a radial line through the centre of the tube and the lowest point of the section of that groove than it is on the other side of that radial line. 5

Dated this 20th day of September, 1944.
E. F. SPANNER.

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1 SHEET

[This Drawing is a reproduction of the Original on a reduced scale.]

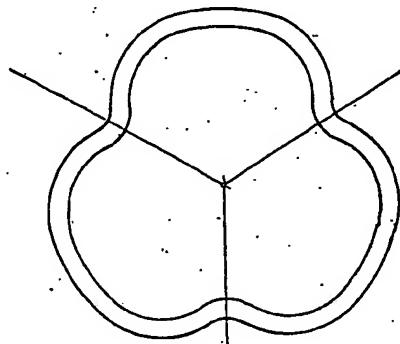


FIG 1.

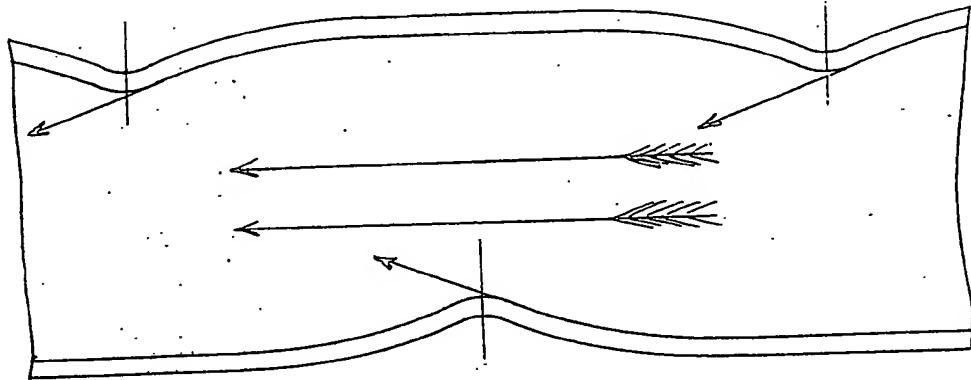


FIG 2.

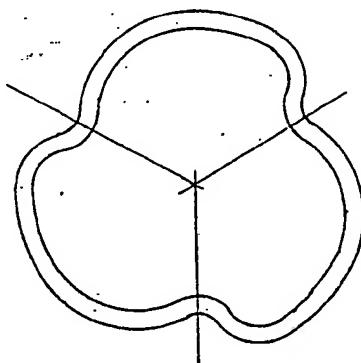


FIG 3.

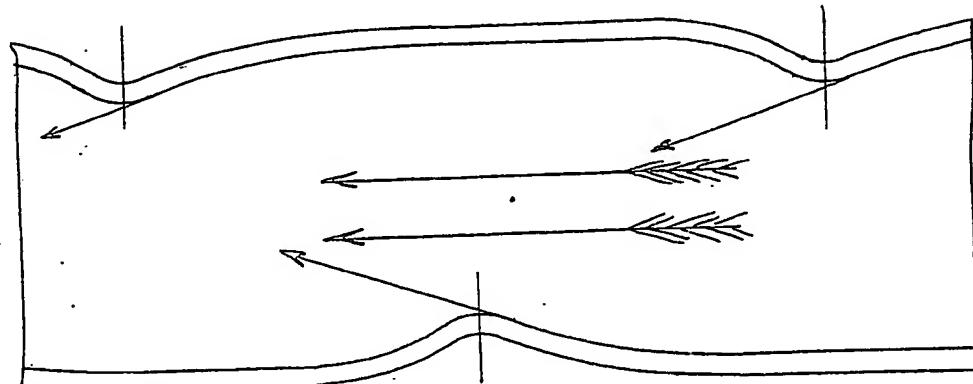


FIG 4.